2007 RESEARCH PROBLEM STATEMENT

Problem Title: Machine Control Guidance **No.:** 07-01-07

Submitted By: Craig Hancock **Email:** chancock@utah.gov

Project Champion: Craig Hancock

(UDOT or FHWA employee who needs this research done, will help the Research Division lead this project, and will spearhead the implementation of the results. If the project gets prioritized at the UTRAC conference, a Champion Commitment Form will be required before funding.)

1. Briefly describe the problem to be addressed.

Recent advances in GPS receiver design, computer processing power, real-time data processing algorithms and availability of rugged touch screen computers have enabled GPS based machine guidance system or grade control system.

This research project would implement a pilot project in construction for a contractor to use machine guidance control

2. Strategic Goal: ☒ Preservation ☒ Operation ☒ Capacity ☒ Safety (check all that apply)

3A. List the research objective(s) to be accomplished:

1. Test and evaluate this technology on a UDOT project. One UDOT project.
2. Information on the "state of the practice" of this technology. Information on research existing systems in use and compatibility.
3. Examine the risks and benefits to UDOT and contractors in implementing this technology
4. Identify the necessary changes to UDOT process. Including DTM's, software and hardware. Generate UDOT generated DTM's. DTM's for quality control.
5. Benefit/Cost analysis

3B. List the major tasks to accomplish the research objective(s): **Estimated person-hours:** 400

1. Find a UDOT project(s)
2. Monitor the process: Field verify by UDOT personnel. Use construction crews. Equipment will be needed to train and verify.
3. Data collection
4. Evaluation
5. Final Report

4. Estimate the cost of this research study including implementation effort (use person-hours from No. 3B): $65,000

5. Indicate type of research and/or development project this is

Large: ☒ Research Project ☐ Development Project
Small: ☐ Research Evaluation ☐ Experimental Feature ☐ New Product Evaluation ☐ Tech Transfer Initiative
☐ Other: _____

(A small project is usually less than $20,000 and shorter than 6 months)

6. Outline the proposed schedule (when do you need this done, and how will we get there):

Complete the evaluation during the the 2008 construction season.

7. What type of entity is best suited to perform this project (University, Consultant, UDOT Staff, Other Agency, Other)?

University or consultant and UDOT Staff.

8A. What deliverables would you like to receive at the end of this project? (e.g. useable technical product, design method, technique, training, workshops, report, manual of practice, policy, procedure, specification, standard, software, hardware, equipment, training tool, etc.)

A report on an evaluation of the technology. Also, recommendations for new polices and changes in design and construction processes, construction specifications, and training. And equipment department requirements.

8B. Describe how this project will be implemented at UDOT.

Could be implemented at UDOT through changes in construction specifications and changes to design and construction practices.

8C. Describe how UDOT will benefit from the implementation of this project, and who the beneficiaries will be.

- Lower Construction costs:
  - The reduction of surveying and grade checking costs and increase of machine utilization. The operator and the machine aren't waiting for surveyors to stake, or re-stake the job.
  - Reduction of the rework caused by the lack of correct information in the field
  - Better machine utilization and fewer hours per volume of dirt moved
- Shorter construction schedules
  - Operators know where the grade is, as well as the locations of design elements, and are able to move more dirt each day. They can work regardless of wind, dust or darkness, finishing jobs faster.
- Encourage more innovative contracting\
- Simultaneous data collection for as-builts, quantity calculations and quality assurance.
- DTM production: By UDOT personnel to reduce costs.

9. Describe the expected risks and obstacles as well as the strategies to overcome them.

Technology has been developed.
Accuracy for the tolerances are already being used.
Field changes may require more work and delay than conventional methods.
Errors made by UDOT design and DTM could cost money.
Equipment compatibility among contractors.

10A. List other people (UDOT and non-UDOT) who are willing to participate in the Technical Advisory Committee (TAC) for this study:

Name	Organization / Division / Region	Phone	Email
Derek Peterson	UDOT ETS	801-965-4037	dpeterson@utah.gov
Karl Verhaeren	UDOT Central Construction	801 965-4869	kverhaeren@utah.gov
Josh Van Jura	UDOT Engineer Resident R-2	801-910-2560	jvanjura@utah.gov

10B. Identify other Utah, regional, or national agencies and other groups that may have an interest in supporting this study: